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HORSE-BREEDING SUGGESTIONS FOR FARMERS



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EASTERN PLAIN EXPERIMENT STATION

TWO LINES of profit are derived by the use of specially selected mares on farms: Raising colts and doing farm work.

To obtain the maximum returns from this system, the animals used for work on the farm should be brood mares and the young horses which are increasing in value.

Mares chosen for work and breeding must be well-bred, sound individuals of desirable conformation. It does not pay to raise scrub colts.

Mares doing this double duty must receive extra feed, care, and management.

The selection of a stallion is highly important. A low service fee should not tempt one to use an inferior stallion.

It is advantageous to produce a uniform lot of foals. Select breeding animals with this in view.

There may be less interference with the farm work if the mares foal in the fall.

Careful choice in mating creates greater possibilities for the offspring, but these possibilities are realized only when nourishing feed and regular attention are given the young animals.

HORSE-BREEDING SUGGESTIONS FOR FARMERS¹

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PROFIT IN BREEDING FARM MARES

FINANCIAL profit results from breeding mares that earn their feed by furnishing farm horsepower. Instances of this are often cited in farm papers. It is not uncommon to read of some remarkable mare that, besides doing her share of the farm work, has raised many hundreds of dollars' worth of colts (fig. 1). These accounts seldom tell of more than one such mare on a particular farm, whereas to obtain the greatest returns nearly all the work animals maintained on the farm should be mares of this kind.

Breeding the working mares places double duty on them; consequently they should be robust individuals of proper conformation and must have good care and treatment. With two sources of profit from one animal, farmers can well afford to pay more for such stock, feed it more heavily, and give it special attention. The small farmer is the one who is most likely to get the best results from such a plan, because he usually works his own teams or is in position to watch them closely and see that they are not ill-treated.

SELECTING BREEDING AND WORKING MARES

The two outstanding requirements in profitable farm mares are that they be breeders and workers. If a good, registered stallion is available, purebred mares of the same breed will probably give better returns than grades. It costs practically no more to raise a purebred colt than it does to raise a grade, and the returns are much greater. The amount of capital that can be invested in the mares is an important factor in determining whether purebreds should be used. The particular breed type that the purebreds or grades should conform to depends largely on local market demands. Some

¹ This is a revision of former editions by H. H. Reese, who resigned in 1926.

communities are noted for and attract buyers of high-class draft horses; others have local dealers who handle many saddle horses; and still others have a ready outlet for horses of the general-utility type, that is, horses that can be worked, driven, or used for riding purposes. In a locality favored with any such markets it is generally advisable to raise the prevailing type, since by so doing sales are more easily made and the services of high-class stallions are practically assured.

However, some persons have a decided preference for a particular breed or type, and where this is so a greater success often is made by raising the kind naturally preferred, although it must be

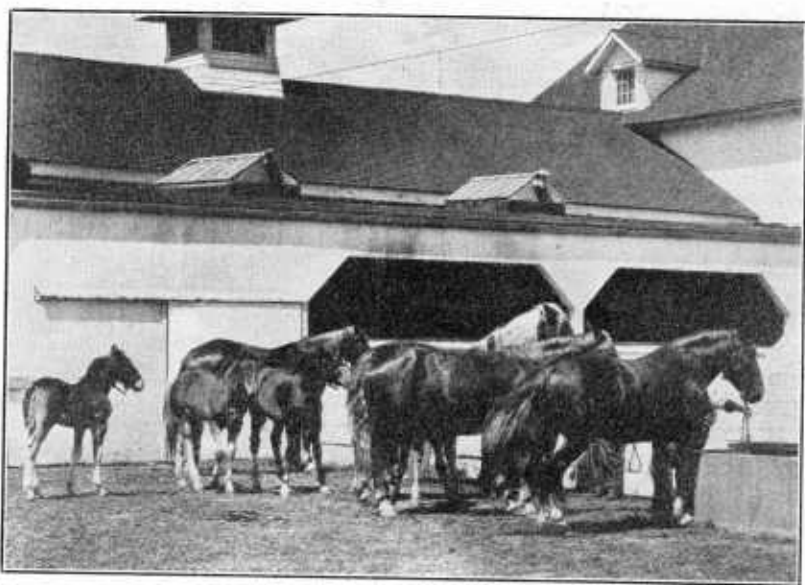


FIGURE 1.—These farm mares do double duty. Besides paying for their feed with work, they annually produce foals that are sold at a profit.

remembered that it is difficult to show a profit when raising something for which there may be but a limited demand. It is generally accepted that light horses are best suited to rolling and semimountainous land, while draft stock is more adaptable to level country.

UNIFORMITY OF THE MARES

Uniformity in the mares kept on a particular farm generally is not given much consideration. There is satisfaction, economy, and convenience, however, in having mares similar enough in type and action so that one can readily fill the place of another at any kind of farm work. Such mares are especially desirable when it is necessary to work them 3 or 4 abreast. In case 4 to a wagon are needed, it is a good advertisement of the owner's judgment and ability as a horseman to have them all uniform, in good condition, and hooked up to a nicety. If the mares resemble one another and are bred to the same stallion it is often possible to sell the young horses as pairs, in which

form they nearly always bring a premium. The market for horses bred in this manner will not be overcrowded very soon, as can readily be attested by anyone who has been confronted with the difficult task of purchasing matched pairs of a certain type.

DESIRABLE CONFORMATION OF MARE

Desirable characteristics in purebred or grade mares signify impressive ancestry and prepotency. Femininity of expression and of conformation is an indication of good breeding qualities. Style, good disposition, quality, clean, flat bone, concave, open feet, strong

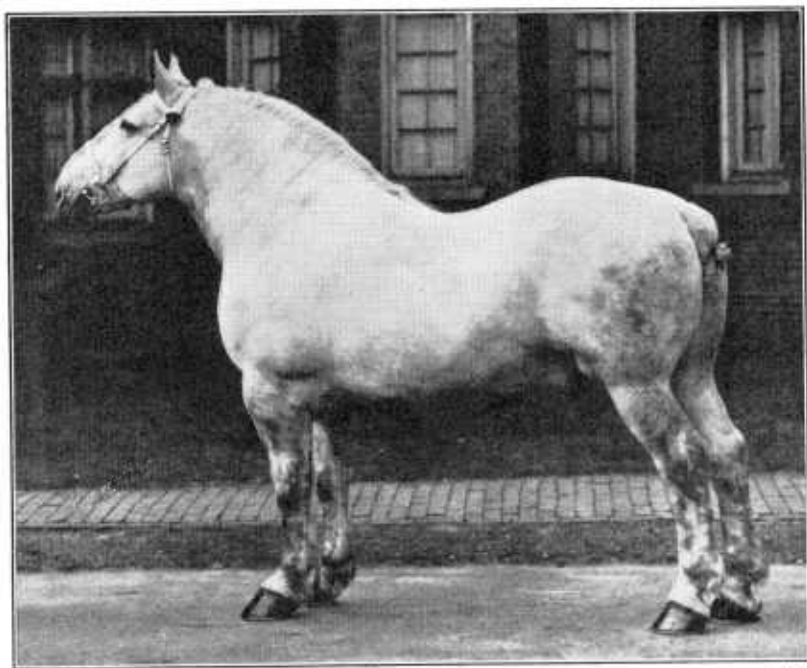


FIGURE 2.—A draft stallion, showing well-set underpinning, substance with quality, short, smooth coupling, well-sloped shoulders, and a head denoting intelligence and refinement.

constitution, good proportions, deep, roomy barrel, width across the hips denoting a large pelvic arch, and well-developed vulva, udder, and teats are qualities especially desired in breeding mares. An inspection of the colts the mare produces is generally the best evidence of her worth as a brood mare. The length of usefulness as producers varies greatly with different mares. Some have excellent colts when 25 years of age, but if they produce until they are 15 years old they do very well. Much depends on the individuals and the way they are handled. Shy breeding mares are generally unprofitable producers.

SOUNDNESS

Unsound horses cause breeders much financial loss; consequently it is of great importance that all horses reared should be as sound as

possible. Usually horses become unsound either because the tissue or the skeletal structure (or both) at a particular point of the body is weak, or because the strain exerted on the part is greater than the best tissue and best conformation can stand. Of course, if bad conformation exists, it is logical that such animals should not be used for breeding purposes whether they are sound or not. When considering horses that are unsound but apparently have good conformation, it usually is difficult to decide whether the conformation is at fault or whether an unbearable strain was the cause; consequently these animals, too, should not be used as breeders unless it is positively known that the unsoundness developed after severe labor had been



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FIGURE 3.—Draft mare of desirable conformation. Note especially the femininity and quality of this mare and her exceptional breediness, as indicated by the clean-cut head and deep, roomy body.

performed in amount or degree much greater than that done by the average horse or that it resulted from purely accidental causes.

Unless caused by unusual circumstances, such as above indicated, any of the following kinds of unsoundness usually are sufficient reason for discarding a mare for breeding purposes: Bone spavin, ringbone, sidebone, heaves, stringhalt, roaring, periodic ophthalmia (moon blindness), and blindness, partial or complete. In the case of stallions, a more strict standard of soundness generally is followed than with mares. The stallion-registration laws of various States usually prescribe the unsoundnesses which bar stallions from public service. Some States have a longer list than others. Without discriminating, however, the foregoing list is one on which horsemen

generally agree. The unsoundnesses there given are the most common and are detected readily.² The elimination of unsound breeding stock, the feeding of balanced rations that will insure proper development of bone and tissues, and careful handling and management of colts are the right steps to take in eliminating unsoundness from horse stock.

SELECTING A STALLION

A low service fee should never tempt one to use an inferior stallion. It may also be better to use a stallion which stands at some distance rather than one that is more convenient. While the purchase price of a stallion is not always in proportion to his worth as a sire, the

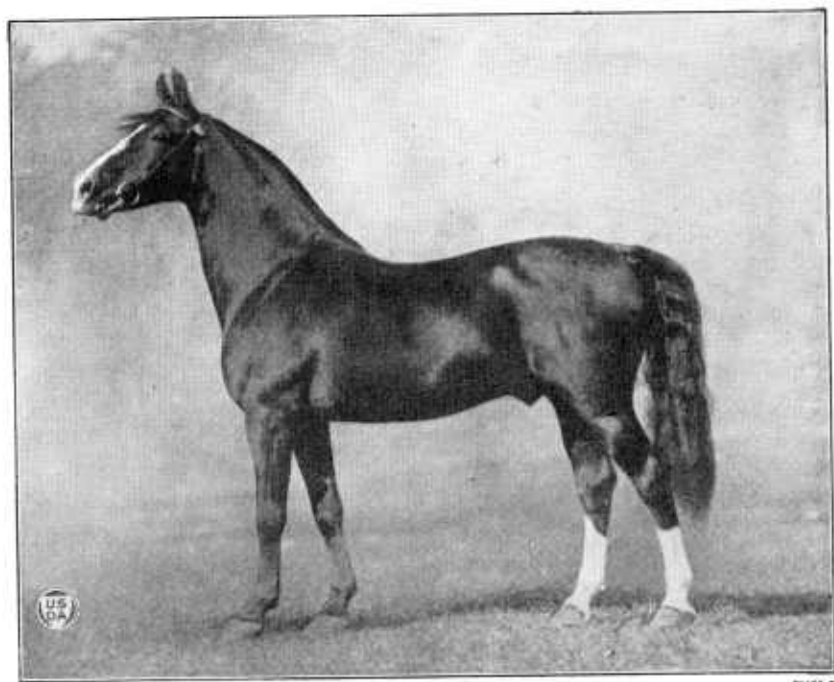


FIGURE 4.—Light stallion with well-set limbs, substance, and quality.

service fee generally is, if the horse has been standing long enough for mare owners to be able to pass judgment on his prepotency and on the quality of the colts he gets. The opinion of disinterested horsemen, together with the stallion's show winnings, will aid in making a good selection. Weight is an indispensable quality in a draft stallion, although it should not offset a deficiency in other respects. In the lighter stallions style, smooth lines, and swift, well-balanced action are necessary to improve light-horse stock. In any breed good feet, clean, flat bone free from meatiness, well-defined hocks, good disposition, quality, animation, and breed characteristics are well worth looking for in the sire. It is poor policy to use anything but a sound, purebred stallion free from manifest faults of

² For further information consult Farmers' Bulletin 779, How to Select a Sound Horse.

conformation, and he should be of the same breed or type as the mare. It must be borne in mind, too, that a stallion that is not properly fed and exercised is not likely to get a large proportion of strong, healthy colts. In short, too much care cannot be exercised in obtaining a suitable mate for the mares and the fundamental law that generally holds in all breeding operations must always be remembered, viz, like produces like or the likeness of an ancestor.

CARE OF THE STALLION

The stallion should be kept in good condition throughout the year. Neglect during some periods and special attention during the breed-

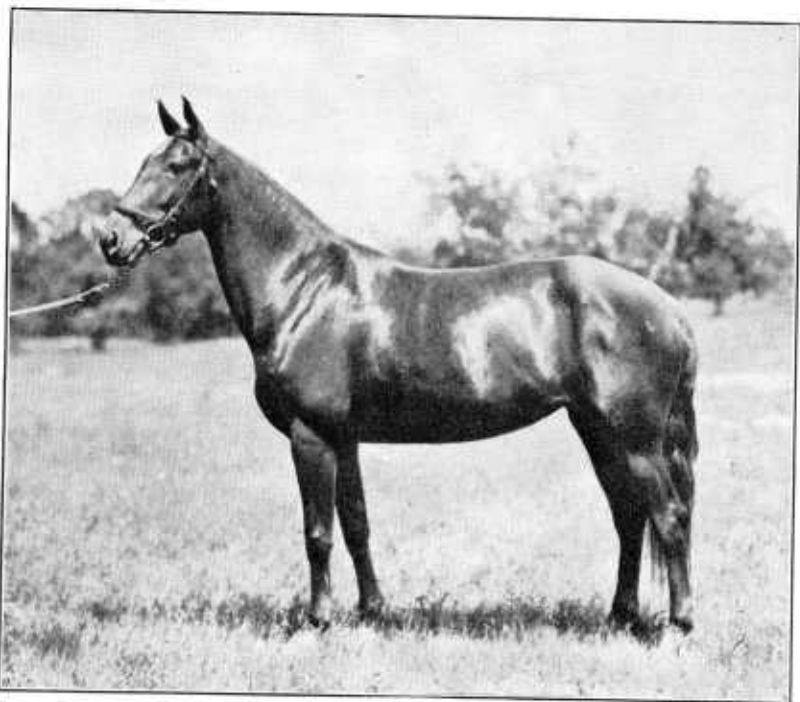


FIGURE 5.—Light mare of desirable conformation. Quality, smooth lines, animation, and indications of strong constitution are shown. 22593-B

ing season form a too common practice that should be avoided. Each day the stallion should have suitable feed, water, and exercise. He should be groomed regularly and thoroughly, have access to salt, and be housed in well-lighted, sanitary, and comfortable quarters in the vicinity of other horses.

The quantity of feed required by a stallion depends on the amount of work or exercise he receives, his condition, size, and individuality, and the methods of feeding and management followed. The following are daily rations suggested for 1,200- and 2,000-pound stallions receiving moderate exercise:

1,200-pound stallion:

- (a) 10 pounds oats, 2 pounds wheat bran, 15 pounds mixed timothy and clover hay.
- (b) 6 pounds shelled corn, 6 pounds oats, 8 pounds timothy hay, 7 pounds alfalfa hay.

2,000-pound stallion:

- (a) 16 pounds oats, 4 pounds wheat bran, 22 pounds mixed timothy and clover hay.
- (b) 10 pounds shelled corn, 10 pounds oats, 10 pounds alfalfa hay, 12 pounds timothy hay.

When comparatively little work or exercise is given, some laxative feed should be included in the ration. Among the best laxative feeds are grass, linseed meal, wheat bran, alfalfa hay, and carrots.

During the breeding season the stallion should receive a ration relatively high in protein and mineral matter. Linseed meal, soybeans, cowpeas, field peas, wheat bran, and the legume hays are high in protein content and suitable for use in the breeding ration. In practically all instances the protein-rich concentrates must be fed in limited amounts, preferably not more than one-third of the total allowance, with the legume seeds (soybeans, cowpeas, field peas) being used only in a ground form. Excessive use of linseed meal, wheat bran, or legume hay will make the ration too laxative.

Working the stallion is generally advisable. When the amount of exercise or work is increased, the grain allowance should be increased. A paddock for exercise is recommended. Six miles of jogging each day is considered moderate exercise for a light stallion. Walking 5 miles each day is usually sufficient exercise for a draft stallion.

The age at which young stallions should be used for service the first time depends greatly on the type of horse, its individuality and development, and the need for breeding service. No stallion should be put into service until he is at least 2 years old, and only exceptionally well-developed draft-type horses should be used when as young as that. Stallions of the light type usually do not mature so rapidly as draft stallions; they generally are not used for service the first time until they are 3 years old. Neither 2-, 3-, nor 4-year-old stallions are mature, and it is advisable to limit the number of services of such young sires until they are fully developed. If necessary, the well-grown 2-year-old draft stallion may serve 10 to 12 mares, with not more than 2 of such services coming in any one week. The 3-year-old sire may be used on 30 to 50 mares; the 4-year-old on 50 to 75; and the mature horse on 75 or more.

The stallion should not be excessively fat nor thin during the breeding season as either condition may render him impotent. One service daily is preferable in most instances for mature stallions. For immature stallions the matings should be spread as far apart as is possible and practicable. If it is necessary to breed the mature horse twice in 1 day, have the matings as far apart as possible, preferably one in the morning and the other late in the afternoon.

MATING CONSIDERATIONS

Only very well-developed draft mares should be bred when as young as 2 years of age. All others should go until 3 years, and some even until 4, if they are not strong or are slow in maturing. If bred at 2 years of age, usually mares should not be mated during

their third year. This gives them a chance for further development without the retarding effects and physical strain caused by maternity.

In most instances producing mares may be expected to have their first estrual (heat) period in 5 to 11 days after the foal is born. This is known as the "foal heat" and, unless settled at this time, the mare will ordinarily come in heat again about every 15 to 21 days thereafter until she becomes pregnant. The length or duration of the heat period varies somewhat among different mares but on an average it approximates 5 days, with ovulation occurring most often from 24 to 48 hours before its termination. Thus, if only one mating is to be made during a heat period, it generally is best to have it on the third day. When two matings are made, usually the first one should be on the third day and the second on the fourth or fifth day. For mares that are very hard to settle, daily matings throughout the heat period may be advisable. The aim in any instance is to arrange the breeding date so that it occurs as near the time of ovulation as possible. This will insure the greatest percentage of conceptions and foals.

Although the foal heat period is often regarded as the best time to breed the mare, experimental evidence obtained from physiology-of-reproduction studies does not support this contention, and more favorable results may be expected normally if mating is postponed to the second or later seasons. This is due principally to the fact that the genital organs and reproductive tract often are not in the condition required for proper fertilization during the foal heat. Of the various types of mares, i. e., lactating, dry, and maiden, those running with foals (lactating) are generally the easiest to get settled, while the smallest percentage of conceptions may be expected from young mares that are being mated for the first time. Some mares do not show signs of being in heat even when tried ("teased") regularly with a stallion, but they often can be settled either by natural or artificial service, provided the approximate time of ovulation is determined and they are not suffering from either a diseased or abnormal condition of the reproductive system.

Taking the mare to the stallion usually results in the most satisfactory service because better accommodations are afforded there for teasing and serving mares, and accidents are less liable to occur. The mare will react at breeding time with more certainty if she is in moderate flesh and a healthy, vigorous condition. Extreme fatness interferes with both the mechanical and physiological performance of the reproductive organs, while thin or weak mares do not "catch" readily. The mare should have ample time to rest after she gets to the stallion's stand, and she may be kept in a box stall adjacent to his prior to mating time. Very often there is too much hurry at this time, and the mare is forced to take the service before she is ready and most receptive. If the weather is cold, the mare should be warmed up by moderate exercise before mating, but she should not be bred when she is either extremely hot or fatigued.

Considerable responsibility rests on the owner or caretaker of the mare in seeing that she is returned to the stallion to be tried and rebred if necessary when her next heat period is due. This is absolutely essential in order to get a large percentage of mares in foal, for many of them fail to conceive as a result of the first service.

Moreover, if the mare is accustomed to dry feed, she should not be turned on pasture soon after breeding. Besides thus suddenly having her feed changed, she may be annoyed and teased by other horses. Hard work immediately after breeding also may hinder a mare from getting in foal.

ARTIFICIAL INSEMINATION ³

Artificial insemination is the introduction of male seminal fluid (semen) containing spermatozoa into the female genital tract (uterus or vagina) by artificial methods. Two distinct operations are involved in this process, (1) collection of semen, and (2) insemination of the mare with some of this fluid.

Various methods have been evolved and used for collecting semen, but the ones most favored now are: (1) The artificial vagina, (2) the breeder's bag, and (3) the semen aspirator. Each of these has its advantages and disadvantages, so it is well to study all aspects of the different collection procedures before selecting the one to be used.

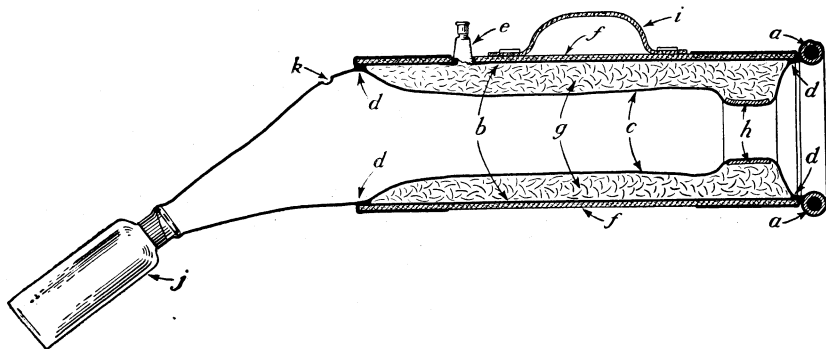


FIGURE 6.—Longitudinal section of the Missouri-U. S. D. A. model artificial vagina for the horse. Length 18 inches, 7-inch rubber tubing, flat diameter; *a*, entrance ring made by enclosing section of $\frac{1}{2}$ -inch garden hose; *b*, outer tube; *c*, inner tube; *d*, points at which the outer tube is vulcanized to the inner tube; *e*, air valve; *f*, leather casing to give support and rigidity; *g*, air space between inner and outer tube which allows for the adjustment of pressure; *h*, the "sphincter" rubber band, made of 3-inch flat-diameter tubing $1\frac{1}{2}$ to 2 inches broad; *i*, handle grip attached to leather casing; *j*, 8-ounce collecting bottle; *k*, air vent to prevent ballooning.

Several types of artificial vaginas have been invented within recent years. Generally, however, such apparatus consists essentially of a rather thin, inner, rubber tube surrounded by an airtight and watertight jacket, made by attaching a heavy, outer cylinder of rubber, glass, ebonite, or metal to the inner one (fig. 6). One end of the inner tube has an opening large enough to permit entrance of the stallion's penis, while the other is tapered so it will fit tightly over the mouth of the glass container used for collecting the semen. Valves are provided in the outer jacket to allow entrance and discharge of the air or water which is used to warm and inflate the instrument before use.

The breeder's bag is an elongated rubber sack which is lubricated on the outside surface and then slipped over and fastened on the

³ For a more complete discussion of this subject consult Circular No. 567, Artificial Insemination in Livestock Breeding.

penis of the stallion just before mating. Such bags may be obtained in different sizes, those for draft stallions being the largest; when properly adjusted and used, they should capture the entire ejaculate. Collection of semen by aspiration involves the use of a suction-type device such as that shown in figure 7. With this the seminal fluid generally is withdrawn from the bottom of the vagina.

In the practice of artificial insemination there are certain procedures which must be followed and precautions taken in order to obtain success. It is highly desirable that the work be conducted or supervised by a veterinarian. A primary consideration is that the operators be trained thoroughly in at least one of the approved methods of semen collection. Also, they must be familiar with the location and function of the mare's genital organs and with stallion and mare management during breeding work. Moreover, the proper apparatus must be on hand, rigid standards of cleanliness must be adhered to, and the entire process should be carried out in a careful, quiet, systematic, efficient fashion.

During collections for insemination purposes, the sire is handled in much the same way as for normal service. Usually at this time it is advisable to clean the penis of dirt, scales, and other foreign material. This can be accomplished by washing that organ with warm water and a mild soap, followed by a thorough rinse with clean, warm water. Moreover, some moderate exercise in the form of walking may be helpful in obtaining prompt service.

There should be evidence that the mare is in heat, and she should be restrained with breeding hobbles. Use of the twitch will not be required unless the mare is unruly and nervous, but her tail should be bandaged and tied, and the entire area around the vulva washed well with soap and warm water or a mild solution of a nonirritating disinfectant in warm water. The washing should be followed by a thorough rinsing with clean, warm water. If it is necessary to douche or flush out the mare's vagina before breeding, a solution made of 1 quart of boiled water (cooled to body temperature), 1 tablespoonful of baking soda, and $2\frac{1}{2}$ tablespoonfuls of salt may be used. Do not breed or inseminate a mare thus treated, however, until 2 or more hours have elapsed.

Semen collections made with live mares and the artificial vagina require at least three operators, one to hold the mare, another to manage the stallion, and the third to handle the instrument. In this procedure the stallion is led up to the mare quietly and slowly and is permitted to mount naturally. As this is accomplished, the operator holding the collection device grasps the penis and directs it sidewise through the front opening and into the lubricated inner chamber of the instrument. The artificial vagina must be maintained in position during service until ejaculation is completed and the stallion dismounts. It is then removed and the bottle containing the semen is detached and either tightly stoppered or its contents emptied into the gelatin capsules to be used for insemination.

Collections made with the breeder's bag and semen aspirator (fig. 7) involve normal breeding service procedures with the exception that the ejaculate in the former method is caught in the rubber container, which is removed and emptied as soon as the stallion

dismounts. Normally two or three operators are required to obtain collections in either of these ways.

The mare or mares to be inseminated must be fully in heat and preferably at that stage of estrus just prior to ovulation. As a precaution against kicking, it is well to apply hobbles, and the use of tail bandages is customary. The quarters used for the work should be clean, dry, dust-free, and fairly well lighted. Just prior to insemination the mare's vulva should be wiped and dried and its inner lips swabbed with clean pieces of cotton. Also, the mare should be placed and held so that her hindquarters are facing the light.

A simple, efficient, and convenient method of insemination is to use a gelatin capsule which will hold from $\frac{1}{2}$ to 1 ounce (15 to 30 cc.) of semen. After being filled and capped, this container is carried

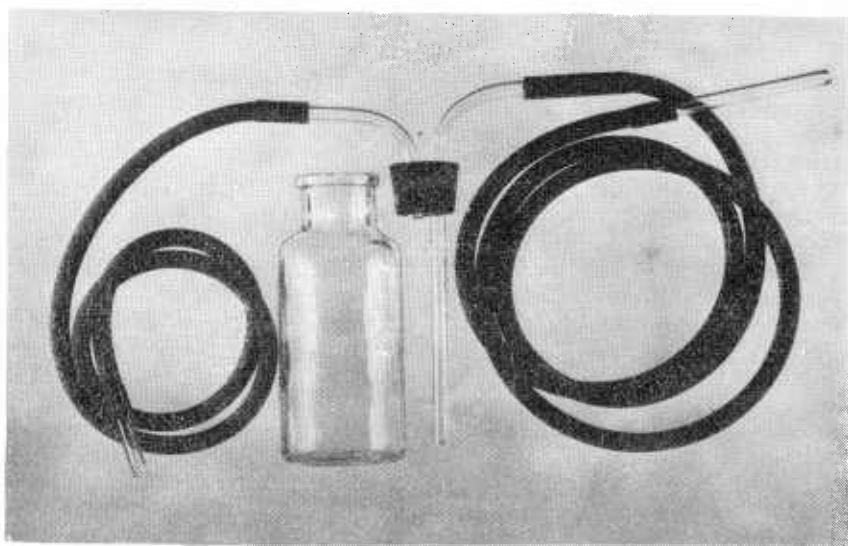


FIGURE 7.—Semen aspirator. A 6-ounce bottle, 2-hole rubber stopper, heavy-walled $\frac{3}{8}$ -inch gum-rubber tubing, and 4 glass tubes are required for this equipment. 69579-B

into the vagina by the hand and is placed well forward in the cervix, with the fingers. For this operation the hand and arm of the operator must be clean and well-lubricated, with the fingernails short and smooth. Some operators prefer to use a rubber glove and obstetrical sleeve during capsuling, because this reduces the chances of causing or spreading infection. Such equipment must be disinfected, washed, and rinsed thoroughly after each insemination, and it should be lubricated on the outside surfaces just before use.

After insemination is completed the hobbles and tail bandage are removed and the mare should be placed in a box stall where she may be watched for about an hour. Particular attention should be paid at this time to see there is no straining or wrenching with consequent expulsion of the semen, for if this occurs, another insemination may be required.

BREEDING RECORDS

Records of the breeding of each mare should be kept in order that the approximate time of foaling may be known. The period of gestation, that is, the time between the fertilization of the ovum and the birth of the young, is variable. This period is ordinarily calculated at 11 months, but to be ready the owner must make preparations for the arrival of the foal prior to that time. The period, however, may vary between 330 and 365 days. A number of reasons have been advanced to explain why there is such a variance in the length of the mare's gestation period. One theory claims that a considerable time may elapse between the service and the actual fertilization of the ovum by the sperm cell. This does not appear to be very plausible, however, as the average length of life of spermatozoa in the female genital tract is known to be very short. Another explanation is that the date of foaling has considerable influence on the length of time that the mare carries her young. This latter consideration appears to have merit, for at the U. S. Morgan Horse Farm, Middlebury, Vt., records show that mares foaling after June 1 averaged 338 days for the gestation period, whereas those foaling earlier in the season had a gestation period of 347 days. This apparently was not due to the difference in individual mares, as the same animals showed a marked difference in the longer time they carried early foals as against late foals. The natural time for foals to come is in the spring, when the air is warm and there are grass, sunshine, and an opportunity for range and freedom. Modern farming methods, however, especially in certain localities, sometimes make it advisable to change nature's ways; consequently the farmer may find it better for the mare to be heavy in foal or suckling a foal in the fall, when the heaviest part of the farm work is over. Flies are not so troublesome in the fall as in the spring, and during the comparatively idle winter months the mare can give practically all her energy to furnishing milk for the foal. By the next spring, the young animal will be ready to turn on pasture, where it will require but little attention. However, fall foals can be raised successfully only when special care and feed are provided during the first winter and where a warm, dry, light, and well-ventilated box stall can be furnished each mare and her offspring.

FEED AND MANAGEMENT OF MARES IN FOAL

The mare will be healthier and the foal stronger at birth if she is used at slow, light work nearly every day; also, parturition is easier. In the summer, if it is not possible to work a mare, she should be turned into an open pasture, where she can get exercise, fresh air, and nutritious feed. Her feed should supply the demand for the maintenance of her own body and also for the development of the fetus. The ration, therefore, should contain a little more protein and minerals than that needed by a working gelding. Furthermore the proportions of these should be increased gradually as the gestation period progresses, particularly during the last half of the period. If the mare is idle in winter much of the feed may be good roughage, but a ration of grain and hay must be fed when work is done. The quantity of feed is determined by the size and condi-

tion of the animal (whether thin or fat, sick or well), by the stage of pregnancy, by the appetite, by the amount of work done, and by individuality, condition of the droppings, and whether the animal is easy or hard to keep.

GRAINS

Oats are the best single grain for the horse. They are a safe, light, palatable, well-balanced feed and may be used as the sole concentrate in the ration. Corn is a good concentrate but is used to best advantage if it forms only from one-third to one-half of the grain ration of the brood mare. When fed heavily, corn should be supplemented with concentrates or roughage rich in protein and mineral matter, as corn is somewhat deficient in these constituents. If wheat is fed it must be ground or rolled and used in small quantities

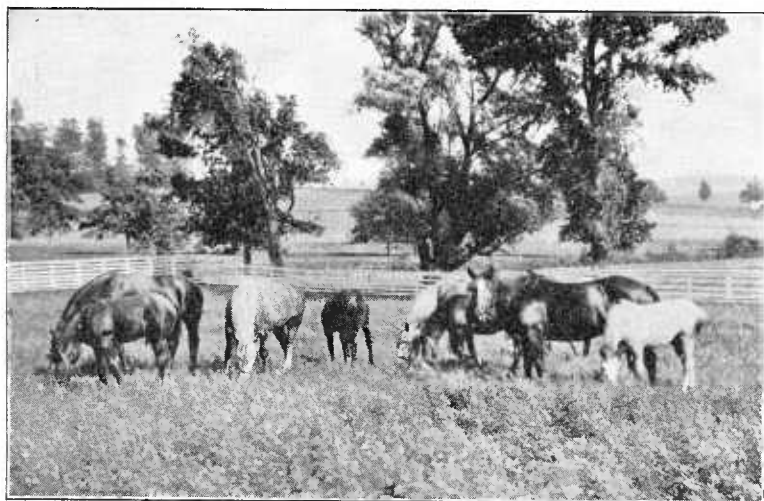


FIGURE 8.—Brood mares and foals in desirable condition and showing the effects of good pasture. Aside from its high cost in most localities, the board fence shown is ideal for surrounding horse pastures.

in order to prevent digestive disturbances. Barley is a good horse feed; it is more bulky than wheat and more nearly like oats than corn in composition. Barley is often cooked and fed once or twice a week in the evening. In most instances it is preferable to grind or roll barley. Wheat bran is an almost essential horse feed, particularly for breeding stock and young animals, and acts as a regulator and a preventive of overfeeding. It is bulky, nutritious, and palatable and lightens the ration. Soybeans and cowpeas are relished by horses and serve as a useful addition to the grain feed for mares in foal. They are relatively rich in protein and consequently combine well with corn. Soybeans and cowpeas should not constitute more than one-third of the grain ration, and they should always be ground for feeding.

ROUGHAGE

Timothy hay is a very popular roughage for horses. Bromegrass also makes good hay. It is higher in protein than timothy. Orchard

grass, if cut in early bloom, is equal to the best of the hays made from grasses, and carries considerably more protein than timothy. Good Johnson grass hay is as valuable as timothy for horses. Sudan-grass hay is a safe feed for mares, and numerous native prairie grasses furnish hay that is equal to timothy. Clover hay is liable to be dusty, but it has good feeding qualities. Millet is not a safe feed for mares in foal. Corn fodder is used frequently to feed idle horses in the winter, but there is not enough nutriment in it alone for mares in foal. The same thing is true, in a greater degree, of straw. If either is used, good-quality hay, preferably legume, should be fed also. Unthreshed cowpea and soybean hay are valuable roughages which are relished by horses. Even the threshed hay is moderately nutritious. It should never be fed to brood mares if it contains any mold, however. Alfalfa hay makes an excellent feed for mares if it is fed once a day and timothy or corn fodder given at the other feeding. Occasionally alfalfa hay is not properly cured and molds badly, in which case it should not be fed. Also, farmers have reported occasionally that alfalfa causes the kidneys to act too freely, but it is probable that this trouble will not be noticed if the alfalfa does not make up more than one-half of the roughage allowance.

SUCCULENCE

Succulent feeds are those which are juicy, appetizing, and easily assimilated. Such feeds have a beneficial, laxative effect on the digestive system and stimulate the appetite. The most common succulent feeds on farms are green grass, carrots, rutabagas, sugar beets, and silage. Grass, although of a succulent nature, is often used as the entire ration throughout the summer if the mares are idle. If they are worked, grass forms a valuable supplement to hay and grain. Brood mares should be allowed access to grass whenever available, the precautions mentioned later being complied with.

ABORTIONS

Data obtained from various sources indicate that approximately 5 percent of the mares impregnated abort each year. It is possible that all abortions are not reported or are not known, in which case the percentage would be still higher. As abortions generally are due to kicks; strains; slips; squeezing through narrow doorways or partly closed gates; excessive and severe riding, driving, or pulling; and improper or moldy feed (such as moldy corn fodder and heavily frost-bitten grass), it is evident that American farmers are losing many thousands of dollars yearly by careless and injudicious handling and management of their brood mares. Furthermore, breeders often have difficulty in getting a mare in foal that has previously aborted, so that the loss may be a far-reaching one. If of the contagious character, abortion may turn a profitable band of brood mares into a practically valueless one, so far as breeding is concerned.

To sum up briefly: Proper feed of sufficient quantity and variety; regularly supplied, uniform, moderate work and exercise; and careful handling will maintain an in-foal mare in proper physical condition to develop a healthy, strong fetus.

APPROACHING PARTURITION

Mares heavy in foal should not be taken from work suddenly, but should be kept in harness at light work (if already accustomed to it) until within a week or a few days of foaling time. A week or so before parturition there is a sinking of the muscles of the croup, falling of the abdomen, and filling of the udder. Usually at this time the mare should be quartered in a dry, sanitary, pleasant, quiet, light, comfortable, roomy box stall. If not accustomed to pasture, she should not be allowed it, but should be given exercise in a dry lot after she is no longer being worked. Moderate exercise is desirable, and occasionally it is necessary to have a sluggish, idle mare led a short distance each day in order that she may get sufficient exercise. Too much exercise at this time is just as detrimental as not enough, and a knowledge of the mare's previous success in delivering a foal, coupled with judgment, will determine the nature and amount of exercise as well as feed, etc., that should be allowed. Wax and sometimes milk will be found on the teats a day or so before foaling. Idle mares frequently develop an udder a longer time before parturition than mares that are worked regularly.

PARTURITION

Indications of immediate parturition are restlessness, sweating, lying down and getting up, switching the tail, and biting the sides and flanks. When the water bag has broken, the foal may be expected momentarily. If possible, be present when the foal comes. Many mares, of course, will not bring forth their young (if able to keep from it) while they are being watched, but it usually is possible to hide quietly in an adjoining stall until the foal is delivered. The mare will foal with the greatest ease if she is lying flat on her side with all legs stretched outward. Moreover, she should not have her hindquarters close to a wall or corner of the stall. Parturition generally lasts 10 to 15 minutes; if it extends to 4 or 5 hours the colt will come dead. In normal presentation of the fetus, either the forelegs extended with the head resting on them or the hind legs extended will first make their appearance through the vulva. Any other presentation may be attended with difficult parturition, in which case a competent veterinarian should be summoned at once.

First after the foal is dropped see that it begins to breathe. Take the film of tissue from its nostrils, and if respiration does not begin immediately blow into the mouth, work the ribs, and rub the body briskly with a wisp of hay or rough towel. If the mare sweats much and the weather is chilly or cold she should be rubbed down, dried, and covered with a light blanket. The foal also should be dried to prevent chilling, and it may then be moved to one corner of the stall so that the afterbirth and discharged fluids may be removed. Clean the stall thoroughly, scatter lime on the bare floor, and then cover it with clean bedding. The afterbirth should be burned or buried deeply with a thick covering of lime. It is one of the best mediums for bacteria of various kinds to develop in; hence it is essential to dispose of it properly.

Foals at birth usually weigh from one-twelfth to one-tenth as much as their dams.

Sunshine is a great enemy of disease germs; consequently plenty of light should be provided in the stables. A common but unhealthy practice, in sections where bank barns are prevalent, is that of having the box stalls next to the bank side of the barn. Besides lacking light, such stalls are liable to be damp; yet it is in such places that mares frequently bear their foals and that the latter are housed. A window is inexpensive and will do much good in such places.

CARE OF THE FOAL

Foals should nurse after they gain strength enough to get on their feet and walk around. If the foals are weak or very crooked-legged, it may be necessary to assist them in getting to the teat, but often an effort is made to force them to nurse before they are ready. Nature takes its own time on such occasions, and hurrying and bustling may do more harm than good. Before the foal nurses, wash the mare's udder and teats with a warm 2-percent solution of a good coal-tar disinfectant and then rinse with warm water. The first milk which comes from the mare is known as colostrum and acts as a physic on the foal, causing the fecal matter in the intestines to be discharged. It is very important that the foal get the colostrum; hence the folly of milking the mare before the foal comes merely because there appears to be too much milk in the udder. If the contents of the bowels are not ejected naturally within 24 hours, 2 to 4 tablespoonfuls of castor oil shaken in milk should be given by mouth and it may also be advisable to inject warm water or 2 ounces of castor oil into the bowels through the rectum. Repeat this treatment every 3 or 4 hours until the bowels move. Petrolatum applied in the rectum may aid in ejecting subsequent dry matter.

To offset the danger of navel infection in foals (which causes a disease known as joint-ill), the navel cord should be washed several times a day by holding up around the cord a large-necked bottle which has been nearly filled with a 1 to 1,000 solution of corrosive sublimate (bichloride of mercury) or by saturating the stump with full-strength tincture of iodine. Then dust it with powdered slaked lime. This should be repeated each day until the navel cord drops off. In case the navel does not dry properly or shows inflammation, a veterinarian should be called. Mares are inclined to be peevish and cross when with their young; consequently it is advisable to perform the foregoing operations as speedily as possible and then leave the stable so that the mare and foal can rest.

FEEDING AFTER FOALING

The mare should not be fed heavily on grain or hay for the first 24 hours after parturition, and the first feeding should consist of a wheat-bran mash with a little cooked flaxseed meal in it. A little oatmeal soaked in warm water is also appropriate. If the mare is constipated give laxative feeds. In 2 or 3 days, if doing well, she may be put back on dry feeds. In a week, if she is put back to work, she can have full feed. The mare may be put in harness, if light work is done, 2 or 3 days after foaling, but it is hard on the foal and may

injure the mare's udder. It is best to turn the mare and colt into a lot where they can exercise and yet be quiet, but care should be taken at first to see that the foal is not chilled by staying out too long in cool, disagreeable weather or by lying on cold, damp ground. They should not be on grass if the mare has not been on grass before.

In a little more than a week the mare may be safely put to work provided she has previously been worked. If the foal is left in the stall, the mare should be brought to the stable in the middle of the forenoon and afternoon in order that the foal may get its food (fig. 9), but in no case should a foal suckle a mare that is very warm, as digestive disorders are liable to follow. If possible, do not use the mare for purposes which will keep her away from the farm for a long time, because the foal will either go too long without nursing or will be worn out by following the mare. When left at the stable, the foal should be kept in a roomy, clean box stall in company with another foal of about the same age if possible.

At about 2 months of age the foal will take dry feed, which should be supplied at first through the dam's grain box. This makes it necessary to furnish her with such feeds as ground oats, corn meal, and wheat bran. A little later a creep should be built in the stall or pasture, inside of which the foal can be given grain without having to share it with its mother. A creep is simply a partition that keeps the mare out of the enclosure, but is far enough from the ground so that the foal can walk under it. A handful of ground oats should be given at first and the quantity increased slowly as the foal grows. The maximum amount should be about 1 pound a day till weaning time.

RAISING THE ORPHAN FOAL

Sometimes a mare dies shortly after foaling, thus leaving her young dependent on artificial feeding for its sustenance; and some mares furnish an insufficient amount of milk for their foals. Cow's milk makes a most logical substitute for mare's milk, but as the composition is different, certain changes or modifications are necessary in order that the supplied diet be not too dissimilar to the natural. Table 1 gives the average composition of the two kinds of milk:

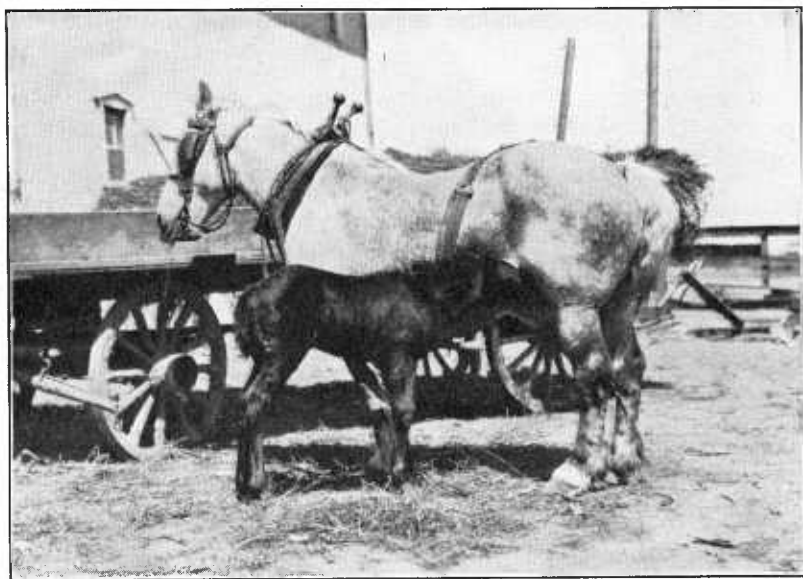
TABLE 1.—*Composition of milk from cows and mares*

Source	Water	Protein	Fat	Sugar	Ash
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Cow.....	87. 17	3. 55	3. 69	4. 88	0. 71
Mare.....	90. 78	1. 99	1. 21	5. 67	. 35

Milk which is not rich in butterfat, preferably from a recently freshened cow, should be diluted about one-half with fresh boiled water. A tablespoonful of sugar and about three teaspoonfuls of lime-water should be added for each pint. This mixture should be supplied to the foal at about body temperature. A bottle with a rubber nipple, or even a finger of a kid glove with a fair-sized hole in it fitted over the end of a spout of a vessel, such as a teapot, will serve as a convenient utensil in getting the foal to take the milk. If

the finger of a kid glove is used it should be clean. At first about one-half cup of milk should be given every hour, the quantity being increased slightly and the intervals lengthened gradually as the foal grows older. In about 2 months skim milk may be substituted for whole milk, and in addition one of the following rations should be fed: 1 part flaxseed meal boiled to a jelly, and 2 or 3 parts wheat bran; or 2 parts ground oats, 1 part corn meal, and one-half part flaxseed meal; or 2 parts wheat bran, 2 parts corn meal, and 1 part linseed meal. Feed a double handful a day at first and increase the quantity gradually thereafter.

Raising a foal by hand is not a job for the careless and indifferent. It requires patience, painstaking care, perseverance, judgment, and cleanliness. The vessel in which the milk is supplied should be



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FIGURE 9.—The young foal should be allowed to suckle the working mare at regular intervals several times a day.

scalded thoroughly each time it is used. Unclean receptacles for the milk and irregular intervals for feeding probably will cause scours. The quarters should be kept very clean, and the orphan should have company of some kind. Another foal is desirable, but even a calf is better than no company. A grassy paddock with abundant shade, fresh, clean water, and protection from flies increase the orphan's chance of proper development.

SCOURS

A most common cause of scours in foals is feeding too much milk at irregular intervals; consequently, better management is the first step in remedying the trouble. Castor oil is often used to check scours, 1 or 2 ounces being the dose for a young foal. Raw eggs are also used successfully. Blood meal is considered one of the best remedies, the quantity used being one-tenth to one-sixth of the

grain ration. Powdered tannic acid also gives quick relief, the dose being from 5 to 15 grains. For other than a mild case a competent veterinarian should be consulted.

WEANING

Foals belonging to mares that work hard should be weaned earlier than those of mares which are practically idle. Although most foals are weaned when about 5 or 6 months old, it is well to remember that it is usually economical to feed a young horse through its mother. However, in case the mare is again in foal, if she is allowed to nurse for more than 6 months it may decrease the vitality of the next foal. If the foal is getting plenty of nourishment from grain, grass, and other roughage, the young animal will not be seriously set back when shut off from its dam's supply of milk. When taken away from its mother it should be placed with another foal of the same sex and age in an enclosure where they cannot possibly get out or be injured. Feeding grain is not absolutely necessary if the foal is on good grass and has been accustomed to it; nevertheless, it has its advantage, especially with draft stock. Foal feeding should always be practiced with orphan animals.

The foal should not nurse more than once after it has been taken from its dam. The excess milk should be taken from the mare's udder from 3 to 5 times a day, but enough should be left so that her system will begin to absorb the milk; otherwise the drying-up process will be delayed unnecessarily. Not withdrawing milk enough may cause the udder to cake. Camphorated oil, petrolatum, or lard rubbed on the udder will aid in keeping it soft.

CASTRATION

Castration is usually performed at the age of about 1 year. However, it may be done when the colt is only a few weeks old, at which time there is less danger to the animal, but the operation at any early age tends to result in an imperfect development of the fore parts. Delaying the procedure until the age of 2, 3, or even 4 years will insure still better development and carriage of the forequarters. The essential steps of castration are the safe removal or destruction of the testicles and the arrest or prevention of bleeding from the spermatic artery which is located in the anterior part of the cord. The operation is best and most safely performed by an experienced veterinarian.⁴

FEEDING AND MANAGEMENT OF YOUNG HORSES

CARE AND FEEDING DURING THE FIRST WINTER

Foals may be housed satisfactorily in either the stable or an open shed. The shed shown in figure 10 is practicable where it is necessary to provide shelter for several head. The main requirements are that the quarters be dry and sanitary, and provide fairly good protection from winds. Several foals may be run together if the

⁴ For further information on castration of the horse see *Diseases of the Horse*, for sale by the Superintendent of Documents, Government Printing Office, Washington, D. C., at \$1 a copy.

weaker ones are not driven away from their feed by the stronger. The quarters should be kept clean and well-bedded and occasionally should be disinfected. Lice are to be suspected when the animals get to rubbing and lose patches of hair. It costs money to feed lice; consequently efforts should be made to keep the foals free from them.⁵ Foals should be in the open almost every day that is not stormy; it is harmful, however, for them to be in a cold rain, heavy snow, or sleet. During the first winter they should be taught to lead and to stand tied.

Feeds that promote growth are highly essential and should be supplied regularly. Good, clean clover hay is palatable, nutritious, and slightly laxative. Timothy hay also is commonly fed. Well-cured alfalfa hay, free from dust, is one of the best roughages for growing, but because of its relatively high protein content it generally is economical to supplement it with other dry roughage, such as timothy, mixed hay, or corn fodder. Besides lending variety to



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FIGURE 10.—A shed open on the south side. A desirable place in which to winter colts unless the climate is too severe.

the ration, such a method of feeding alfalfa offsets any likelihood of kidney or bowel irregularities. Sheaf oats can be used to advantage to supplement other roughage. With such feed little grain of other kinds will be required. The animals should not be allowed to gorge themselves on dry feed. They should be given only what they will clean up readily, but at the same time enough feed should be supplied. Oats, corn, and peas, preferably well-ground, are suitable. Wheat bran, linseed meal, or gluten feed will add protein and lend variety. Cottonseed meal should not be fed to foals. Appropriate grain rations for the first winter are: 2 parts corn, 5 parts oats, 3 parts wheat bran, and 1 part linseed meal; or 4 parts oats, 1 part corn, and 1 part wheat bran.

Silage should not be fed to foals to any considerable extent. Sliced roots, such as carrots and sugar beets, are very palatable and have a

⁵ For further information on lice consult Circular 148, *Parasites and Parasitic Diseases of Horses*, obtainable from the Superintendent of Documents, Washington, D. C., at 10 cents a copy.

beneficial effect on the digestive system. The quantity of feed generally should be regulated by the appetite, although occasionally the appetite may be too ravenous to be a good indication of the animal's needs. The general condition of the foal and the droppings should be observed daily. Usually not more than 1 pound of grain per 100 pounds of live weight should be fed until the animal is 2 years old. A liberal supply of salt and pure water and plenty of fresh air and exercise are essential for the proper development of young horses. Idleness succeeding exercise causes constipation. It is often said that a horse is made during its first winter. Certainly this is a critical time in the animal's life, and at no other age will proper feed and attention do as much to make a good horse. If stunted during the first winter, the animal never gains proper size and shape.

CARE AND FEEDING DURING THE SECOND SUMMER

Foals should be changed from dry feed to pasture gradually, and they should not be turned on pasture until the grass is old enough not to be washy. Grass is an indispensable factor in the economical and proper physiological development of young horses. Frequently in protected bluegrass mountain valleys they thrive the year round on pasture alone. A visit to the pasture every few days may be the means of promptly discovering cases of sickness or injury. The feet of the young animals should be noticed on such visits, and if the hoofs are too long at the toe or high on one side they should be trimmed properly. Failure to keep the feet level may result in crooked legs, cracked hoofs, or crooked joints. Barbed wire should not be used for fencing the pasture; a board fence is preferable. Smooth, woven-wire fences also may be used.

If a foal should be cut, disinfect the wound; and if the cut is very large, have it sewed up. The wound should be dusted frequently with boric acid or air-slaked lime until healed, and then greased with petrolatum so that the hair will grow. The animals should have plenty of fresh water and salt, and in hot weather they require shade.

CARE AND FEEDING DURING THE SECOND WINTER

During the second winter the feed and management should be nearly the same as for the first winter, except that the quantity of feed should be increased somewhat, the colt tied up in his stall, and handled frequently. Education by gentle and careful but firm handling at this age will save much strenuous labor later. In this connection Farmers' Bulletin 1368, *Breaking and Training Colts*, should be consulted.

THE 3-YEAR-OLD

The succeeding years are largely a repetition of those already discussed, so far as feed and management are concerned, although the quantity of feed must be gradually increased as the animal grows. In general, the prime essentials for the proper development of horses from the yearling stage until they are put to work are: Fresh air; pure water; plenty of exercise; nutritious, palatable feed in sufficient quantity; and protection from severe weather.

